Quadratics

$3x^2+5x-9$

$y=3(x+4)^2+8$

vertex $(-4,8)$

Different Forms

Polynomial $f(x)=ax^2+bx+c$

Vertex (standard) $f(x)=A(x-H)^2+K$

factored $f(x)=A(x-R_1)(x-R_2)$

Max/min

Polynomial (find zeros) avg. then

vertex (H,K)

Factored (avg. roots, plug in)

Zeros

Factor it

Quad. Formula

Completing the sq.

vocab p. 86

Parabola

vertex

zeros, roots, x-int.

increasing/decreasing

max/min → vertex

axis of symmetry

Completing the Square

$x^2-2x-6=0$ Note must $=0$

get constant to other side

$x^2-2x=6$

$\frac{1}{2}(-2)=-1,\ (-1)^2=1$ Take $\frac{1}{2}$ b-term, square it, add to both sides

$x^2-2x+1=6+1$

$(x-1)^2=7$ Factor lft side, simplify rt. side

always factors into $\left(x+\frac{1}{2}\text{b-term}\right)^2$

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vertex + vertex form

$(x-1)^2-7=0$

Constant back over

vertex $(1,-7)$

Find roots

$\sqrt{(x-1)^2}=\sqrt{7}$ solve it

$x-1=\pm\sqrt{7}$

$x=1\pm\sqrt{7}$ zeros

$(1+\sqrt{7},\ 0)$

x-int $(1-\sqrt{7},\ 0)$

Try Complete the square

① $x^2 - 12x + 5 = 0$

$x^2 - 12x = -5$

$\frac{1}{2}(-12) = -6, (-6)^2 = 36$

$x^2 - 12x + 36 = -5 + 36$

$(x-6)^2 = 31$

② $x^2 + 4x - 4 = 0$

$x^2 + 4x = 4$

$\frac{1}{2}(4) = 2, (2)^2 = 4$

$x^2 + 4x + 4 = 4 + 4$

$(x+2)^2 = 8$

③ $x^2 + 6x + 34 = 0$

$x^2 + 6x = -34$

$\frac{1}{2}(6) = 3, (3)^2 = 9$

$x^2 + 6x + 9 = -34 + 9$

$(x+3)^2 = -25$

Completing the square

$\frac{2x^2}{2} + \frac{8x}{2} + \frac{3}{2} = \frac{0}{2}$ took out a 2

$x^2 + 4x + \frac{3}{2} = 0$

$\vdots$

$(x+2)^2 = -\frac{3}{2} + 4$ put in a 2

$\frac{5}{2}$

$2(x+2)^2 = 5$

vertex $(-2, -5)$

Other things of note

- max/min w/ polynomial fcn

$$H = \underbrace{-\frac{b}{2a}}_{\text{(x-coord)}} \qquad K = \underbrace{f\left(\frac{-b}{2a}\right)}_{\text{(y-coord)}}$$

- To find the A-term given the vertex and a point.
  - plug in the vertex for h + k

$$y = a(x-h)^2 + k$$

  - plug in the other given pt. for x and y, solve for a

Sect. 2.1

#1-8, 11, 12, 13-26(3), 27-33(odd), 35-38(2), 39-42(2)

Review Sheet

Sect. 2.1

#57-59(odd), 61+62

#31 Complete the square, find roots, find vertex, sketch graph

$f(x) = -2x^2 + 16x - 31$

$\frac{}{-2} \quad \frac{}{-2} \quad \frac{}{-2}$

$0 = x^2 - 8x + 15.5$

$x^2 - 8x + 16 = -15.5 + 16$

$(x-4)^2 = \frac{1}{2}$

$-2(x-4)^2 = -1$ → $-2(x-4)^2 + 1 = 0$

vertex $(4, 1)$

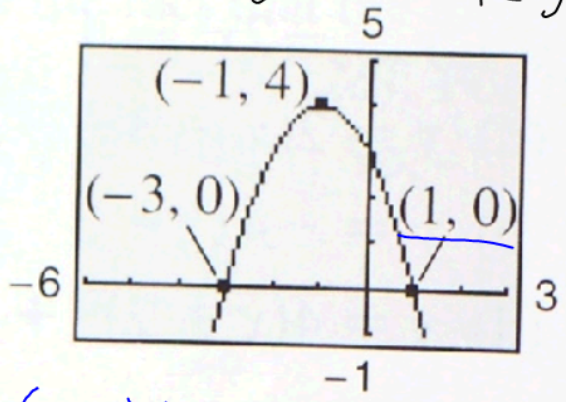
Roots

$\sqrt{(x-4)^2} = \sqrt{\frac{1}{2}}$

$x - 4 = \pm\sqrt{\frac{1}{2}}$ → $\frac{\sqrt{1}}{\sqrt{2}} = \frac{1}{\sqrt{2}}$

$x = 4 \pm \frac{\sqrt{2}}{2}$

37. Write the equation for the graph



$y = a(x - R_1)(x - R_2)$

$y = -(x-1)(x+3)$

$y = a(x-h)^2 + k$

$y = a(x+1)^2 + 4$

$0 = a(1+1)^2 + 4$

$0 = 4a + 4$

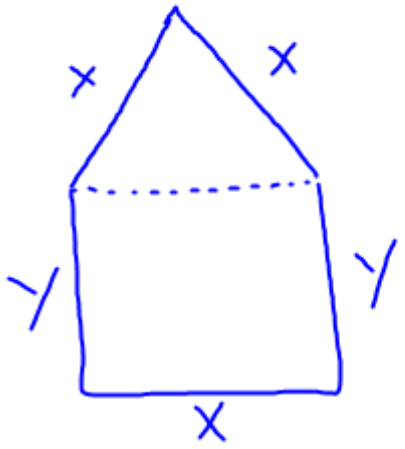
$-4 = 4a$

$a = -1$

$y = -(x+1)^2 + 4$

Window Pains:

A special window has the shape of a rectangle surmounted by an equilateral triangle. If the perimeter of the window is 16 feet, what dimensions will admit the most light (maximize the area)?



Homework

Read 2.2 do the checkpoint problems